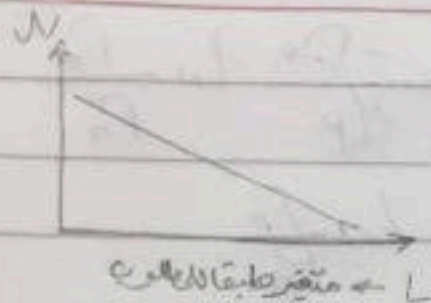


Current

Drift



$$I_n = -q D_n \frac{N}{L}$$

carrier density  $\leftarrow L$

Diffusion

$$I \propto \frac{dn}{dt}$$

$$I_n = q A D_n \frac{dn}{dx}$$

$$I_p = q A D_p \frac{dp}{dx}$$

$$J_{tot} = q \left( D_n \frac{dn}{dx} - D_p \frac{dp}{dx} \right)$$

P-N Junction



$\therefore$  equilibrium at all points



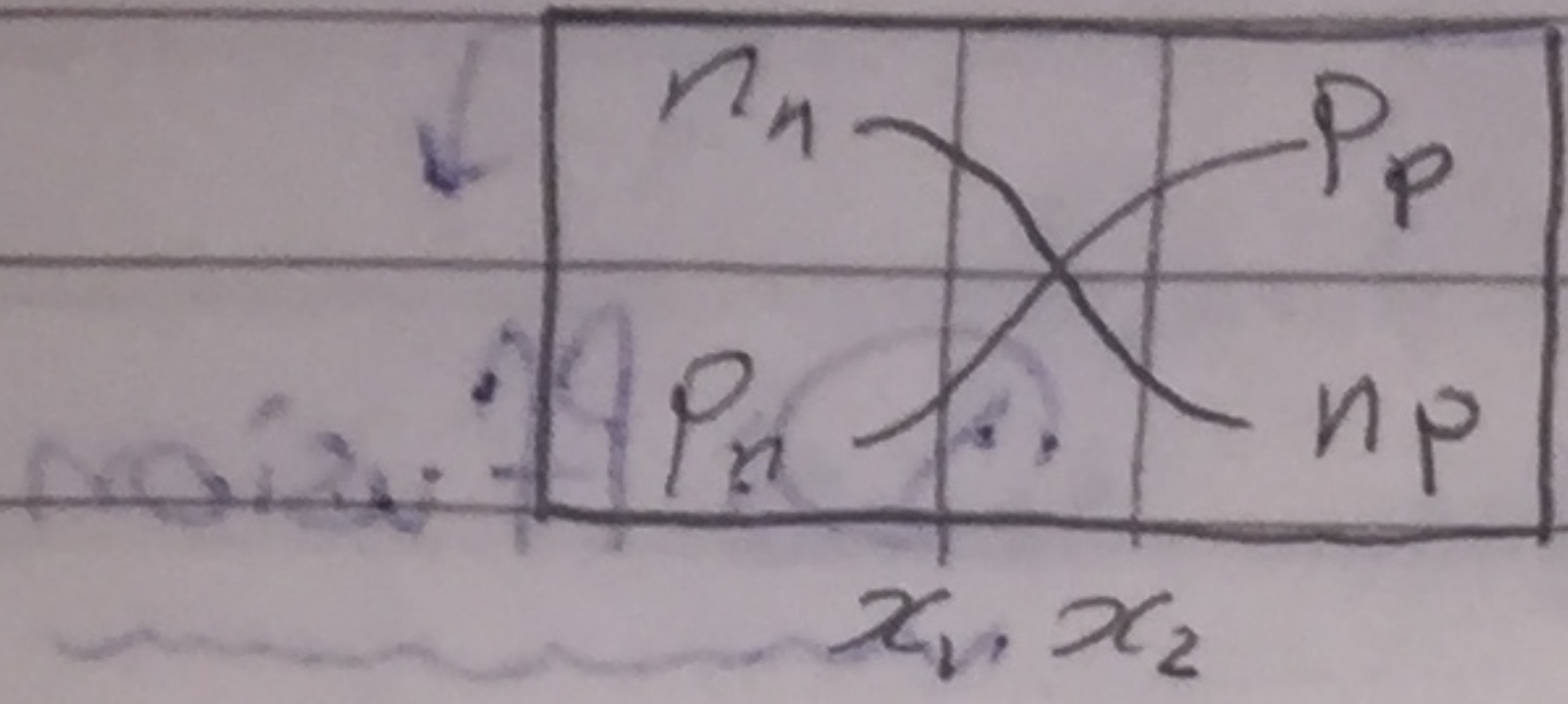
$$I_{drift p} = I_{diff p}$$

$$-q A p E = q D_p \frac{dp}{dx}$$

$$-q A p \frac{dv}{dx} = q D_p \frac{dp}{dx}$$



Homework

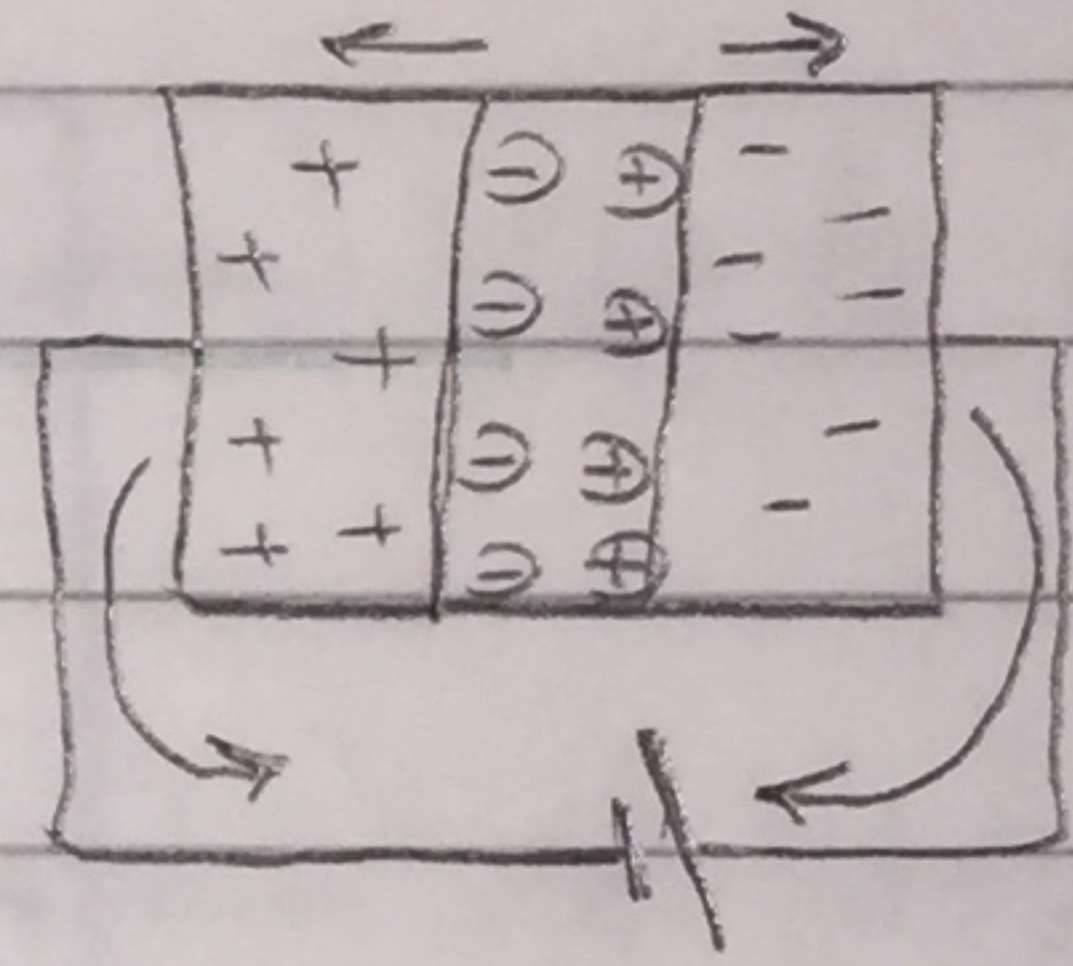


$$-\mu_p \int_{x_1}^{x_2} dv = D_p \int_{p_n}^{p_p} \frac{dp}{p}$$

$$V(x_2) - V(x_1) = \frac{-D_p}{\mu_p} \ln \frac{p_p}{p_n}$$

$$|V_0| = \frac{KT}{q} \ln \frac{p_p}{p_n}$$

$$V_0 = \frac{KT}{q} \ln \frac{N_A N_D}{n_i^2}$$



$$C = \frac{EA}{d}$$

$$V = Ed$$

$$C_j = \frac{C_{j0}}{\sqrt{1 + \frac{V_R}{V_0}}}$$

$$C_{j0} = \sqrt{\frac{E_s q}{2} \frac{N_A N_D}{N_A + N_D} \frac{1}{V_0}}$$

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$$C_j = C_{j0} \text{ at } V_R = 0$$

